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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/905,761	07/13/2001	Gaylon S. Campbell	8050	3577

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EXAMINER	
JACKSON, ANDRE K	

ART UNIT	PAPER NUMBER
2856	

DATE MAILED: 07/14/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/905,761	CAMPBELL ET AL.	
	Examiner	Art Unit	
	André K. Jackson	2856	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *7,11,12,14 and 16-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *7,11,12,14 and 16-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 7,12,14,16-18 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodhead et al. in view of Kaufmann and Ida.

Regarding claim 7, Woodhead et al. discloses an oscillator to provide a square wave voltage signal and a transmission line having an input and an output (Columns 2-5). Woodhead et al. do not explicitly disclose a phase detector; a semiconductor circuit being indicative of a logical exclusive OR function of signals applied to the first and second inputs of the circuit and a low pass filter. Kaufmann discloses an oscillator to provide a square wave voltage signal and a phase detector and a low pass filter (Page 5, Figure 1; 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodhead et al. to include a phase detector and a low pass filter. By adding this feature the apparatus would be able to precisely detect the moisture within the soil since there would be a difference in the waves and the difference being the presence of moisture. Ida discloses in "Constant amplitude control of electromechanical oscillators" where the instrument can be used in various applications including moisture monitoring and the

instrument includes a phase detector (13); a low pass filter (14) and a semiconductor circuit being indicative of a logical exclusive OR function of signals applied to the first and second inputs of the circuit (Figure 2, Column 5, lines 58-68; Column 6, lines 1-14). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodhead et al. to include a semiconductor circuit being indicative of a logical exclusive OR function of signals applied to the first and second inputs of the circuit. By adding this feature the circuit would be able to output a signal dependent on the states of the sensors.

Regarding claim 12, Woodhead et al. do not disclose where a frequency domain waveform is used to measure the phase difference. However, Kaufmann and Ida disclose where a frequency domain waveform is used to measure the phase difference (Pages 4-6 and Column 6) respectively. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodhead et al. to include this parameter. By adding this feature the apparatus would be able to accurately measure the moisture with the medium.

Regarding claim 14, Woodhead et al. disclose where insulating the transmission line form the bulk material being measured (Column 3).

Regarding claim 16, neither Woodhead et al. nor Kaufmann explicitly disclose where the low pass filter has a resistor and a capacitor

connected to the output of the semiconductor circuit producing a DC voltage proportional to the phase difference of the signal provided to the first and second inputs. However, Ida discloses where the low pass filter has a resistor and a capacitor connected to the output of the semiconductor circuit producing a DC voltage proportional to the phase difference of the signal provided to the first and second inputs (Columns 5-6). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodhead et al. to include where the low pass filter has a resistor and a capacitor connected to the output of the semiconductor circuit producing a DC voltage proportional to the phase difference of the signal provided to the first and second inputs. By adding this feature the apparatus would be able to provide a reading directly corresponding to the resistance of the soil.

Regarding claim 17, Woodhead et al. do not explicitly disclose where the semiconductor circuit has electrical traces on an elongated printed circuit boards. Kaufmann discloses where the semiconductor circuit has electrical traces on an elongated printed circuit boards (Figures 2-4). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodhead et al. to include where the semiconductor circuit has electrical traces on an elongated printed circuit boards. By adding this feature the user would be able to keep the apparatus small and portable.

Regarding claim 18, Woodhead et al. disclose sensing a dielectric constant of the bulk materials (Abstract). Woodhead et al. do not explicitly disclose where the semiconductor circuit has electrical traces on an elongated printed circuit board, and where the electrical traces on the elongated printed circuit board senses based on the measured phase difference. However, Kaufmann discloses where the semiconductor circuit has electrical traces on an elongated printed circuit board, and wherein the electrical traces on the elongated printed circuit board senses the measured phase difference (Figures 2-4). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodhead et al. to include where the semiconductor circuit has electrical traces on an elongated printed circuit board, and wherein the electrical traces on the elongated printed circuit board sense a dielectric constant of the bulk materials based on the measured phase difference. By adding this feature the user would be able to accurately determine the moisture within the medium.

Regarding claim 23, Woodhead et al. disclose an oscillator to provide a square wave voltage signal; a transmission line having an input and an output, the transmission line input transmission line output being coupled to receive the square wave voltage signal (Columns 2-5). Woodhead et al. do not disclose where the transmission line output being coupled to a phase detector; the phase detector detecting a phase

difference between the square wave voltage signal provided by the oscillator and the signal provided to the transmission line, the phase detector providing an output signal indicative of the phase difference caused by changes in moisture content of a medium surrounding the transmission line. Kaufmann discloses an oscillator to provide a square wave voltage signal and the phase detector detecting a phase difference between the square wave voltage signal provided by the oscillator and the signal provided to the transmission line, the phase detector providing an output signal indicative of the phase difference caused by changes in moisture content of a medium (Page 5, Figure 1; 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodhead et al. to include a phase detector. By adding this feature the apparatus would be able to precisely detect the moisture within the soil since there would be a difference in the waves and the difference being the presence of moisture. Ida discloses where the instrument can be used in various applications including moisture monitoring and that the instrument includes the phase detector detecting a phase difference between the square wave voltage signal provided by the oscillator and the signal provided to the transmission line, the phase detector providing an output signal indicative of the phase difference (Figure 2, Column 5, lines 58-68; Column 6, lines 1-14). Therefore, it would have been obvious to one of ordinary skill in the art at

the time the invention was made to modify Woodhead et al. to include where the transmission line output being coupled to a phase detector; the phase detector detecting a phase difference between the square wave voltage signal provided by the oscillator and the signal provided to the transmission line, the phase detector providing an output signal indicative of the phase difference caused by changes in moisture content of a medium surrounding the transmission line. By adding this feature the circuit would be able to output a signal dependent on the states of the sensors.

Regarding claim 24, Woodhead et al. disclose providing a transmission line having an input and an output, embedding the transmission line into a bulk material, providing a signal to the input of the transmission line (Abstract, columns 2-5). Woodhead et al. do not disclose providing a phase detector and the phase detector measuring a phase difference between the reference signal and the output signal from the transmission line to determine a moisture content of the bulk material surrounding the transmission line. Ida discloses a phase detector and the phase detector measuring a phase difference between the reference signal and the output signal from the line to determine a moisture content of the material (Figure 2, Column 5, lines 58-68; Column 6, lines 1-14). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodhead et al. to include a

phase detector and the phase detector measuring a phase difference between the reference signal and the output signal from the transmission line to determine a moisture content of the bulk material surrounding the transmission line. By adding this feature the circuit would be able to output a signal dependent on the states of the sensors.

Regarding claim 25, Woodhead et al. disclose determining the dielectric constant of the bulk material (Abstract). Woodhead et al. do not disclose determining the phase difference to measure the moisture content of the bulk material. However, Ida discloses measuring the phase difference between signals (Column 6, line 5). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodhead et al. to include determining the dielectric constant of the bulk material by the phase difference to measure the moisture content of the bulk material. By adding this feature the circuit would be able to output a signal dependent on the states of the sensors.

3. Claims 11 and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Woodhead et al. in view of Campbell et al. and Kaufmann and further in view of Ida.

Regarding claim 11, Woodhead et al. disclose the use of time domain reflectometry (Column 2). Campbell et al. also discloses the use of time domain reflectometry waveform is used to measure the phase difference (Abstract). Detecting a phase difference is done by both

Kaufmann and Ida. Therefore, to modify Woodhead et al. to include the measurement of the phase difference while incorporating the use of time domain reflectometry would be within the purview of the skilled artisan. By adding this feature the apparatus would be able to accurately measure the moisture with the medium.

Regarding claim 19, Woodhead et al. disclose first and second elongate members (Column 2) an oscillator to provide a square wave signal and a transmission line being coupled to receive the square wave voltage signal form the oscillator through a resistor and (Columns 2-5). Woodhead et al. do not explicitly disclose is where the sensor electronics is mounted on the first member and a phase detector to detect the difference in phase between the square wave voltage signal and the signal provided to the transmission line, the phase detector being further constructed to provide an output signal indicative of the difference in phase between a square wave signal provided to the transmission line through the resistor and response of the transmission line. However, Campbell et al. has where the sensor electronics is mounted on the first member (Page 37). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Woodhead et al. to include where the sensor electronics is mounted on the first member since this would make the invention more compact. Woodhead et al. do not explicitly disclose direct current; however, it is considered a design

choice and well within the purview of the skilled artisan to include a direct current source. Kaufmann discloses an oscillator to provide a square wave voltage signal and a phase detector to detect the difference in phase between the square wave voltage signal and the signal provided to the line, the phase detector being further constructed to provide an output signal indicative of the difference in phase between a square wave signal provided to the line through the resistor (Page 5, Figure 1; 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodhead et al. to include a phase detector. By adding this feature the apparatus would be able to precisely detect the moisture within the soil since there would be a difference in the waves and the difference being the presence of moisture. Ida discloses where the instrument can be used in various applications including moisture monitoring and the instrument includes a phase detector to detect the difference in phase between the square wave voltage signal and the signal provided to the line, the phase detector being further constructed to provide an output signal indicative of the difference in phase between a square wave signal provided to the transmission line through the resistor and response of the line (Figure 2, Column 5, lines 58-68; Column 6, lines 1-14). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodhead et al. to include a phase detector to detect the difference in

phase between the square wave voltage signal and the signal provided to the transmission line, the phase detector being further constructed to provide an output signal indicative of the difference in phase between a square wave signal provided to the transmission line through the resistor and response of the transmission line. By adding this feature the circuit would be able to output a signal dependent on the states of the sensors.

Regarding claim 20, Woodhead at al. disclose where the sensor electronics is proportional to the water content of bulk material (Abstract, column 2).

Regarding claim 21, Woodhead et al. do not disclose a semiconductor circuit having first and second inputs and an output, the output of the semiconductor circuit being indicative of the phase difference of the signals applied to the first and second inputs of the semiconductor circuit, the first input of the semiconductor circuit being coupled to the oscillator to receive the square wave voltage signal and the second input of the semiconductor circuit coupled to the transmission line, a resistor and a capacitor providing a low pass filter connected to the output of the semiconductor circuit producing a DC voltage proportional to the phase difference of the signals provided to the inputs. However, Ida discloses a semiconductor circuit having first and second inputs and an output, the output of the semiconductor circuit being indicative of the phase difference of the signals applied to the first and second inputs of the semiconductor

circuit, the first input of the semiconductor circuit being coupled to the oscillator to receive the square wave voltage signal and the second input of the semiconductor circuit coupled to the transmission line, a resistor and a capacitor providing a low pass filter connected to the output of the semiconductor circuit producing a DC voltage proportional to the phase difference of the signals provided to the inputs (Figure 2, Column 5, lines 58-68; Column 6, lines 1-14). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Woodhead et al. to include the limitations of Ida. By adding this feature the circuit would be able to output a signal dependent on the states of the sensors.

Regarding claim 22, Woodhead et al. disclose where the dielectric constant of a bulk medium is using a transmission line embedded in the bulk material and the transmission line comprising traces on an elongated circuit board having a semiconductor circuit (Columns 3 and 4).

Response to Arguments

4. Applicant's arguments with respect to claims 7,11,12,14 and 16-~~18~~ 25 have been considered but are moot in view of the new grounds of rejection.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to André K. Jackson whose telephone

number is (571) 272-2196. The examiner can normally be reached on Mon.-Thurs. 7AM-4PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hezron Williams can be reached on (571) 272-2208. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A.J.

July 9, 2004

HELEN KWOK
PRIMARY EXAMINER